IN THE CLAIMS

--1. (CURRENTLY AMENDED) A centrifugal separation system comprising:

fluid delivery means powered by a motor for providing a cylindrical vortex fluid flow;

a separation chamber for containing said fluid flow; and

a collector for collecting matter;

wherein said fluid flow centrifugally ejects said matter therefrom into said ~~separation chamber~~ collector.

2. (CANCELLED)

3. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 1 wherein said fluid delivery means is powered by an electrical motor.

4. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 1 wherein said fluid delivery means is powered by a combustion motor.

5. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 1 wherein said motor is powered by compressed gas.

6. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 1 wherein said fluid delivery means is powered by a motor that is powered by a flowing fluid.

7. (ORIGINAL) A centrifugal separation system according to claim 1 wherein said separation chamber is cylindrical.

8. (ORIGINAL) A centrifugal separation system according to claim 1 wherein said fluid delivery means comprises an impeller assembly.

9. (ORIGINAL) A centrifugal separation system according to claim 1 wherein said fluid delivery means comprises a centrifugal pump.

10. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 1 wherein said fluid delivery means comprises at least one propeller.

11. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 1, wherein said collector and said separation chamber are configured such that a pressure is developed in said collector that is greater than the pressure in said separation chamber.

12. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 1, wherein said matter is selected from the group consisting of dust, nails, screws, nuts, dirt, and sand.

13. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 1 further comprising an inner tube and an outer tube, said inner tube and said outer tube being coaxial and coupled to said separation chamber, wherein the gap between said inner tube and said outer tube forms an annular duct.

14. (PREVIOUSLY PRESENTED) A centrifugal separation system comprising:

fluid delivery means for providing a fluid flow;

a separation chamber for separating matter from said fluid flow;

a collector for collecting said separated matter;

an inner tube and an outer tube, said inner tube and outer tube forming an annular duct; and

flow straightening vanes provided within said annular duct to straighten said fluid flow.

15. (PREVIOUSLY PRESENTED) A centrifugal separation system comprising:

fluid delivery means for providing a fluid flow;

a separation chamber for separating matter from said fluid flow;

a collector for collecting said separated matter;

an inner tube and an outer tube, said inner tube and said outer tube forming an annular duct, said annular duct ending in a toroidal vortex nozzle.

16. (ORIGINAL) A centrifugal separation system according to claim 1 wherein said collector is removable for emptying the contents of said collector.

17. (ORIGINAL) A centrifugal separation system according to claim 1 wherein said collector further comprises a door for emptying the contents of said collector.

18. (ORIGINAL) A centrifugal separation system according to claim 1 wherein said collector further comprises a removable stopper for emptying said collector.

19. (PREVIOUSLY PRESENTED) A centrifugal separation system comprising:

fluid delivery means for providing a fluid flow;

a separation chamber for separating from said fluid flow;

a collector for collecting said matter;

an opening in the wall of said separation chamber, said opening leading into said collector;

an outer tube coupled to said separation chamber; and

an inner tube located inside said outer tube, said inner tube and said outer tube being coaxial, wherein the gap between said inner tube and said outer tube forms an annular duct.

20. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19 wherein said fluid delivery means is powered by a motor.

21. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19 wherein said fluid delivery means is powered by an electrical motor.

22. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19 wherein said fluid delivery means is powered by a combustion motor.

23. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19 wherein said fluid delivery means is powered by a motor that is powered by a compressed gas.

24. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19 wherein said fluid delivery means is powered by a motor that is powered by a flowing fluid.

25. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19 wherein said separation chamber is cylindrical.

26. (ORIGINAL) A centrifugal separation system according to claim 19 wherein said fluid delivery means comprises an impeller assembly.

27. (ORIGINAL) A centrifugal separation system according to claim 19 wherein said fluid delivery means comprises a centrifugal pump.

28. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19, wherein said fluid delivery means comprises at least one propeller~~s~~.

29. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19, wherein said collector and said separation chamber are configured such that a pressure is developed in said collector that is greater than the pressure in said separation chamber.

30. (PREVIOUSLY PRESENTED) A centrifugal separation system according to claim 19, wherein said matter is selected from the group consisting of dust, nails, screws, nuts, dirt, and sand.

31. (ORIGINAL) A centrifugal separation system according to claim 19 further comprising:

flow straightening vanes provided within said annular duct to straighten said fluid flow.

32. (ORIGINAL) A centrifugal separation system according to claim 19 wherein said inner and outer tubes end in a toroidal vortex nozzle.

33. (ORIGINAL) A centrifugal separation system according to claim 19 wherein said collector is removable for emptying the contents of said collector.

34. (ORIGINAL) A centrifugal separation system according to claim 19 wherein said collector further comprises a door for emptying the contents of said collector.

35. (ORIGINAL) A centrifugal separation system according to claim 19 wherein said collector further comprises a removable stopper for emptying said collector.

36. (CURRENTLY AMENDED) A method of centrifugally separating matter from a fluid comprising the steps of:

utilizing a fluid delivery means powered by a motor to provide a cylindrical vortex fluid flow within a separation chamber; and

centrifugally ejecting said matter into a collector.

37. (PREVIOUSLY PRESENTED) A method according to claim 36 wherein said fluid flow is delivered to said separation chamber via an inner tube coupled thereto.

38. (PREVIOUSLY PRESENTED) A method according to claim 36 wherein said fluid flow exits said separation chamber via an annular duct created between an inner tube and an outer tube, wherein said inner tube delivers said fluid flow to said separation chamber, and wherein said inner tube and said outer tube are coaxial.

39. (PREVIOUSLY PRESENTED) A method according to claim 36 further comprising the step of creating a higher pressure in said collector than in said separation chamber such that said cylindrical vortex fluid flow is maintained without impeding said matter from carrying into said collector.

40. (PREVIOUSLY PRESENTED) A method according to claim 38, wherein said annular duct straightens said fluid flow.

41. (PREVIOUSLY PRESENTED) A method according to claim 38, wherein a toroidal vortex nozzle is located at the distal end of said inner tube and said outer tube.

42. (CANCELLED)

43. (CANCELLED)

44. (CANCELLED)

45. (CURRENTLY AMENDED) A method according to claim 36 wherein said fluid delivery means comprises an impeller coupled to said motor ~~provides said cylindrical vortex fluid flow~~.

46. (CURRENTLY AMENDED) A method according to claim 36 wherein said fluid delivery means comprises at least one propeller coupled to said motor ~~provides said cylindrical vortex fluid flow~~.

47. (CURRENTLY AMENDED) A method according to claim 36 wherein said fluid delivery means comprises ~~a~~ said motor ~~is~~ coupled to a centrifugal pump ~~which provides said cylindrical vortex fluid flow~~.--

REMARKS

Initially, Applicants thank the Examiner for finding claims 1 and 3-35 allowable. Applicants have cosmetically amended independent claim 1 to overcome the informality noted by the Examiner. Importantly, this amendment was for reasons unrelated to patentability, as claim 1 was allowed. Claim 36 has been amended to highlight the distinctions between the present invention and the cited art. Applicants have amended claims 45-47 for cosmetic reasons, i.e., to make the language consistent with amended claim 36. Applicants believe that the foregoing amendments and the comments that follow will convince the Examiner that the rejections and objections in the September 25, 2003 Office Action have been overcome and should be withdrawn.

I. THE INVENTION

The present invention is generally an improved centrifugal separator capable of separating even fine particulate from a fluid flow. Importantly, this centrifugal separator requires no filters, vacuum bags, or liquid baths because it utilizes a highly efficient fluid flow. Thus, separation performed by the present invention is efficient and low-maintenance.

The preferred embodiment of the present invention utilizes concentric tubing for input and output ducts. Specifically, an inner tube is coaxially disposed within an outer tube such that fluid may flow into the separator via the inner tube and exit the separator via the annular duct formed between the inner and outer tubes. A toroidal vortex nozzle may be formed at the end of the inner and outer tubes to create a toroidal vortex vacuum system. However, the present invention can be used in any system that requires the separation of matter from fluid flow.

The separation of the present invention occurs in a separation chamber, and the separated matter is collected in a collector located on the side of the separation chamber. Preferably, an impeller is implemented to move fluid flow through the system. In operation, the centrifugal separation proceeds as follows: fluid flow is pulled into the inner tube via suction created by the impeller; the impeller spins the fluid flow (at its blade speed) into a cylindrical vortex; the fluid flow travels along the wall of the separation chamber while matter is centrifugally ejected into the collector; and cleaned fluid flow is expelled out the annular duct between the inner and outer tubes.

Importantly, the present invention has numerous advantages over conventional separation devices in the art. First, the impeller fulfills the dual purpose of providing the necessary suction and spinning the fluid flow into a cylindrical vortex. Consequently, fluid flow can be spun at extremely high speeds. Also, a pressure exceeding the pressure in the separation chamber is developed inside the collector. This higher pressure helps maintain the cylindrical vortex fluid flow without impeding the matter from being centrifugally ejected into the collector. Because separation is centrifugal, separators of the present invention may operate in any orientation independently of gravity. Additionally, the high speed vortex allows even small particulate to be separated without the use of filters, vacuum bags, or liquid baths that compromise the fluid flow's efficiency. Moreover, only smooth directional changes are made to the fluid flow, allowing for an energy efficient flow design. Consequently, the present invention provides a highly efficient separation system that is simple in design and requires virtually no maintenance.

II. **THE EXAMINER'S OBJECTIONS**

The Examiner objected to claims 38, 40, 41, and 45-47 for being dependent upon a rejected base claim, but would be allowable if rewritten in dependent form incorporating all limitations of the base claim.

III. **THE EXAMINER'S REJECTIONS**

The Examiner rejected claims 36, 37, and 39 under 35 U.S.C. § 102(b) as being anticipated by Powell et al. U.S. Pat. No. 4,405,265 (hereinafter referred to as "Powell"). The Examiner stated that Powell teaches a

> "method of centrifugally separating matter from a fluid comprising the steps of utilizing a motor (28) to provide a cylindrical vortex fluid flow within a separation chamber (12), and centrifugally ejecting said matter (through holes 32) into a collector (33). Powell et al further teaches wherein the fluid flow is delivered to separation chamber via an inner tube coupled thereto. Powell et al further teaches creating a higher pressure in the collector than in the separation chamber such that the cylindrical vortex fluid flow is maintained without impeding the matter from carrying into the collector."

IV. **THE EXAMINER'S OBJECTIONS AND REJECTIONS SHOULD BE WITHDRAWN**

A. CLAIM OBJECTIONS

The applicants respectfully submit that the Examiner's objections should be withdrawn in view of the amendments to independent claim 36, discussed *infra.*

B. CLAIM REJECTIONS UNDER 35 U.S.C. § 102(b)

The Examiner has rejected claims 36, 37, and 39 under 35 U.S.C. § 102(b) as being anticipated by Powell.

Applicants direct the Examiner to newly amended independent claim 36. Applicants have amended this claim, in accordance with the Examiner's suggestion, to make it clear that the vortex flow is generated by a fluid delivery means powered by a motor. Because Powell does not teach or suggest this step (as the Examiner indicated in his comments with respect to claims 45-47), Applicants submit that this claim is now in condition for allowance. Accordingly, dependent claims 37 and 39 are also in condition for allowance. Applicants respectfully submit that in light of these amendments, the above-mentioned rejections and objections should be withdrawn.

In light of the foregoing amendments and remarks, Applicants submit that the specification, drawings, and all pending claims are now in condition for allowance.

CONCLUSION

Applicants submit that all pending claims represent a patentable contribution to the art and are in condition for allowance. Early and favorable action is accordingly solicited.

Respectfully submitted,

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John W. Olivo, Jr.
Reg. No. 35,634
Ward & Olivo
382 Springfield Ave.
Summit, NJ 07901
908-277-3333